

Vol 1.5 Nbr 1.2

MILATAJ NEWSLETTER

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January 1986

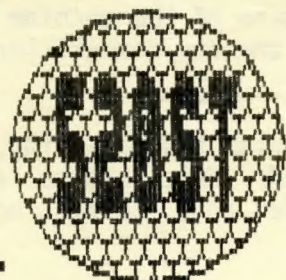
Calendar of Events

January 18, 1986 Monthly Meeting Armbruster School
7000 Greenway, Greenfield
(OFF 68th 1 Block North of Grange)

2:15PM - C Language Class
2:15PM - 520ST SIG Meeting
3:30PM - Business Meeting

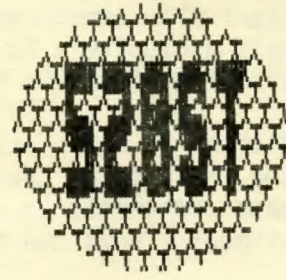
3rd Annual Swap Fest

January 23, 1986 Board of Directors Meeting
Ground Round Bluemound & Hwy 100 **6:30 PM**



D · E · G · A · S

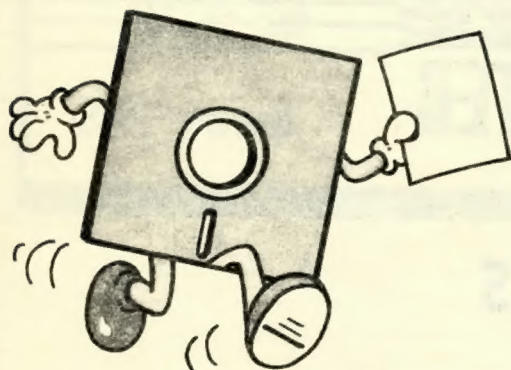
A Quick Review
By Roy Duval



This Program is quite **Outstanding**. I purchased this program 5 days ago and have ported over a number of 8 bit fonts to use with the program. DEGAS offers most of the standard graphic tools such as draw, line, point, K-line, fill, circle, disc, frame, box, polygon, moves, copies, mirrors, airbrush, shadowing, and text modes. I haven't drawn a complete picture yet, but the newsletter will certainly be using this product. For about \$40 I highly recommend it.



JANUARY SWAP FESTIVAL



FROM THE DISK OF
Dave Frazer

Our third annual winter swap fest will highlight our January meeting. Bring in those adventure game which you have solved to many times to trade for new ones. How about the old printer which got put on the shelf when you upgraded? How about the old 300 BAUD modem that was replaced by a 1200 BAUD unit? Don't forget the beginning BASIC book - if it hasn't lost too many pages, there is probably a new ATARI owner who can get some use from it.

Bring all copyright material on its original media with original documentation.

GOOD LUCK LINDA: BASIC instructor Linda Scott will be leaving for Europe. Linda is working on her Ph.D. and will be doing research over there. We wish Linda good luck in her new endeavor.

Because of Linda's departure, we are looking for a new BASIC instructor. It will be time to begin a new series of BASIC classes soon for the many new ATARI owners joining our club. If you are skilled in BASIC, can make group presentations and could use a little extra money, please see me at the next meeting. We are also looking for FORTH language and ASSEMBLER language instructors.

SWAP FEST: The 14th annual midwinter Swapfest will be held on Saturday, January 11th at the Waukesha Exposition Center Forum. This annual event is sponsored by the West Allis Radio Amateur Club and is a favorite for our hacker members.

ATARI TO START SELLING 520 ST COMPUTERS IN MASS-MARKET STORES: This headline appeared in the January 3, 1986 Wall Street Journal. According to the article, Atari Corp. said it plans to start selling its 520 ST personal computer through mass-merchandise store.

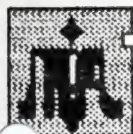
Atari also announced that it will introduce a more powerful version of the machine to be sold exclusively in computer specialty stores to compensate for the new competition they will face from the mass marketers.

Michael V. Katz, Atari's executive vice president in charge of sales and marketing, said the ST's price could drop significantly in mass-market stores. Mr. Katz said he expects mass merchants to offer a version of the ST that can be connected to a television set, without a separate monitor, for less than \$500.

Mr. Katz also announced a new version of the ST, which will have a million characters of memory, will be available in specialty stores by late January for \$999.

TREASURER'S REPORT: Treasurer Steve Tupper supplies the following information concerning MILATARI finances;

Beginning Balance (Dec 1st)	\$340.14	Ending Balance (Dec 31st)	\$289.20
Income		Expenses	
Memberships	115.00	Disks	138.00
Donations	14.38	BBS phone	27.41
Sales	403.75	Newsletter	302.93
=====		Printing	78.23
533.13		Rent	67.50
		Xmas party	20.00
		=====	
		624.07	



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SPECIAL THANKS TO TOM KASSEL: I would like to take this opportunity to thank Tom Kassel and Computer Software Center for his continued advertising support of our newsletter. Computer Software Center always has a large selection of the latest 8-bit and 16-bit Atari software in stock.

BBS NEEDS YOU: Sysop Rich Dankert tells me that the MILATARI BBS has a lot of time available for members. If you do not have your password yet, see Rich at the next meeting.

A bulletin board, private message base and programs to download are some of the features available for you. Rich will be happy to help you use this valuable resource.

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disk

(disk) n. A record-shaped object with a magnetized surface used to store data in a computer system.

bit

(bit) n. 1. The smallest unit of storage in a computer; short for binary digit. 2. A single pulse in a group of pulses.

There are usually eight bits in a byte.

ADDENDUM TO HARDWARE MOD ON PAGE 4 ↓

LIST OF CONNECTIONS FOR THE UPGRADE CIRCUIT

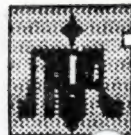
Along with a drawing of the upgrade circuit, below is a list of connections. Each entry in the list begins with the name of the signal followed by all the IC pins that connect together and share the signal. IC3-13 means pin 13 of IC3. The IC numbers appear in the parts list above. IC1 is the 74LS158 chip from socket U27 on the XL motherboard. DIP is the DIP header to be plugged into socket U27. U23-xx refers to the pins you bend up on the PIA chip at U23 on the motherboard.

Vcc : DIP-16, IC1-16, IC2-16, IC3-16, IC3-13
Vss : DIP-8, IC1-8, IC2-8, IC2-1, IC2-15, IC3-8
A7 : DIP-11, IC2-10, IC2-11
A15 : DIP-10, IC2-13, IC3-3
A6 : DIP-14, IC2-6, IC2-5
A14 : DIP-13, IC2-3, IC3-2
MUX : DIP-1, IC1-1, IC2-2
A4 : DIP-2, IC1-2
A12 : DIP-3, IC1-3
RA4 : IC1-4, DIP-4
A5 : DIP-5, IC1-5
A13 : DIP-6, IC1-6
RA5 : IC1-7, DIP-7
-E : DIP-15, IC1-15
RA7 : IC2-9, DIP-9
RA6 : IC2-7, DIP-12
PB2 : U23-12, IC2-4
PB3 : U23-13, IC2-12
PB4 : U23-14, IC3-1
PB5 : U23-15, IC1-10
PB6 : U23-16, IC1-11
-Zd : IC1-9, IC3-14
-O1a : IC3-5, IC3-15, IC2-14
-O2b : IC3-10, One side of resistor
RA8 : Other side of resistor, Pin 1 of all RAMs

If your U7 part number is C012296, do not connect signal A7 above, and make the following additional connections. The connection to U7 is to a trace on the motherboard that runs from pin 8 of U7.

Vcc : DIP-16, IC4-16, IC5-14, IC4-3
Vss : DIP-8, IC4-8, IC4-2, IC4-15, IC5-7, IC5-2,
IC5-12
A7 : DIP-11, IC4-6
-REF : U7-8, IC4-1
REF : IC4-4, IC5-1
A7' : IC4-7, IC2-10, IC2-11
Q7 : IC5-8, IC4-5
Q3 : IC5-6, IC5-13

=====



Hardware Mod

CLAUS BUCHHOLZ

A 130XE-COMPATIBLE 256K UPGRADE FOR THE ATARI 800XL

I designed the 256K upgrade described in my article, "The Quarter-Meg Atari" (BYTE, September, 1985), in December, 1984. Since this predated the 130XE, there was no precedent for extended memory on the XL's. I felt free to implement a system of eight 32K banks. The major reason was to keep the add-on circuit as simple as possible.

The 130XE, introduced in early 1985, set a different standard for bank-select memory. It uses 16K banks and makes them separately available to both the CPU and the video controller (ANTIC). The XE has 128K total memory. The 64K extended RAM is split into four 16K banks.

A 256K 800XL has 192K extended RAM, which requires 12 16K banks. I have designed a new upgrade for the 800XL that implements such a scheme. Its similarity to the 130XE's scheme allows use of software for the XE on a 256K 800XL.

To select one of four banks, the XE uses two bits, #2 and #3, in the memory control register (port B of the 6520 PIA, addressed at \$D301 or 54017 decimal). Zeroing bit #4 makes the selected bank appear at addresses \$4000-\$7FFF (16384 to 32767 decimal), as seen by the CPU. Zeroing bit #5 makes it appear there as seen by ANTIC.

In my upgrade, bits #2, #3, #5 and #6 select one of the twelve banks. Zeroing bit #4 makes the selected bank appear at \$4000-\$7FFF to both the CPU and ANTIC. So, any program for the XE that uses the extended RAM for CPU storage will work on an 800XL with this mod. Those programs won't use the additional 128K, though. Programs that use the video banking feature of the XE might run on the modified XL, but the screen display will be wrong.

The procedure for this upgrade is basically the same as in the article, except for the following points. If your ANTIC (U7) part number is C021697, use the circuit of the figure, excluding the area inside the dotted lines. If it is the C012296, include the circuit inside the dotted lines. The circuit requires five connections to the PIA (U23). So pins 12 through 16 must be bent up and connected to the circuit. The rest of the procedure is the same. Notice that this circuit has one more chip than the article's circuit. This is the price of compatibility.

With the 256K dynamic RAMs in your XL, be sure to wait at least ten seconds after turning the computer off before you turn it

back on. Otherwise it may not coldstart properly.

My original RAMdisk software doesn't work with this new mod. Enclosed is a listing of the new version. It is used in the same way, except that it offers a choice of either two single-density RAM disks or one double-density. If you wish a disk copy of the source and object code, send me a blank disk and return mailer with full postage, and I will promptly send it back with the software (Claus Buchholz, 201C East Edgewood, Lansing, MI 48910). Alternately, you may download the software from the Capitol Hill Atari Owners' Society BBS at 517-371-1106 or from the Castle Communications board at 517-371-4234. The source file is called QMEGXLD.SRC for Quarter-MEG XL Double.

Also available is a RAMdisk program that sets up one single-density RAMdisk and leaves the XE-equivalent banks free for XE software. This is quite useful with BASIC XE, DOS 2.5, or the new Synapse software. Its name is QMEGXLS.SRC.

I ask one thing in return for this information: please pass it around to all your interested friends. Put it in your club's library or on your favorite BBS. Encouraging software support of 256K will result in many interesting uses for it. Thank you and enjoy!

P.S. In response to an often asked question, I state that I have no documentation for my 192K upgrade for the 800. It involves modifying an Axlon 32K board to imitate a 128K Axlon RAMDISK and upgrading an Atari 16K board to 64K. It is a difficult mod, and I recommend the XL mod instead.

(SLOC JOURNAL EDITOR'S NOTES: We recommend reading the BYTE article mentioned above for a better description of the basic modification, then apply this article's information to your mod.)

PARTS LIST

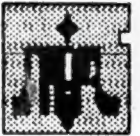
- 8 41256 256K-bit dynamic RAM (200ns or less)
- 1 74LS153 Dual 4-to-1 multiplexer
- 1 74LS139 Dual 2-to-1 decoder
- 1 33 ohm, 1/4 watt resistor
- 1 Radio Shack # 276-150 circuit board
- 1 16-pin DIP header and short ribbon cable
- 3 16-pin low profile sockets

ADDITIONAL PARTS FOR ANTIC #C012296

- 1 74LS158 Quad Inverting 2-to-1 multiplexer
- 1 74LS393 Dual 4-bit counter
- 1 16-pin low profile socket
- 1 14-pin low profile socket



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DEFINITION OF MEMORY CONTROL REGISTER AT \$D301 (54017 decimal)

XL MOD

130XE

bit: 7 6 5 4 3 2 1 0
D a b E c d B R

bit: 7 6 5 4 3 2 1 0
D V C x y B R

D=0 enables diagnostic ROM

B=0 enables BASIC ROM

R=1 enables OS ROM

E=0 enables extended RAM

abcd is 4-bit extended RAM bank #

- ranges from 4 to 15

- banks 12 to 15 are equivalent to XE's banks 0 to 3

D=0 enables diagnostic ROM

B=0 enables BASIC ROM

R=1 enables OS ROM

V=0 enables extended RAM for video

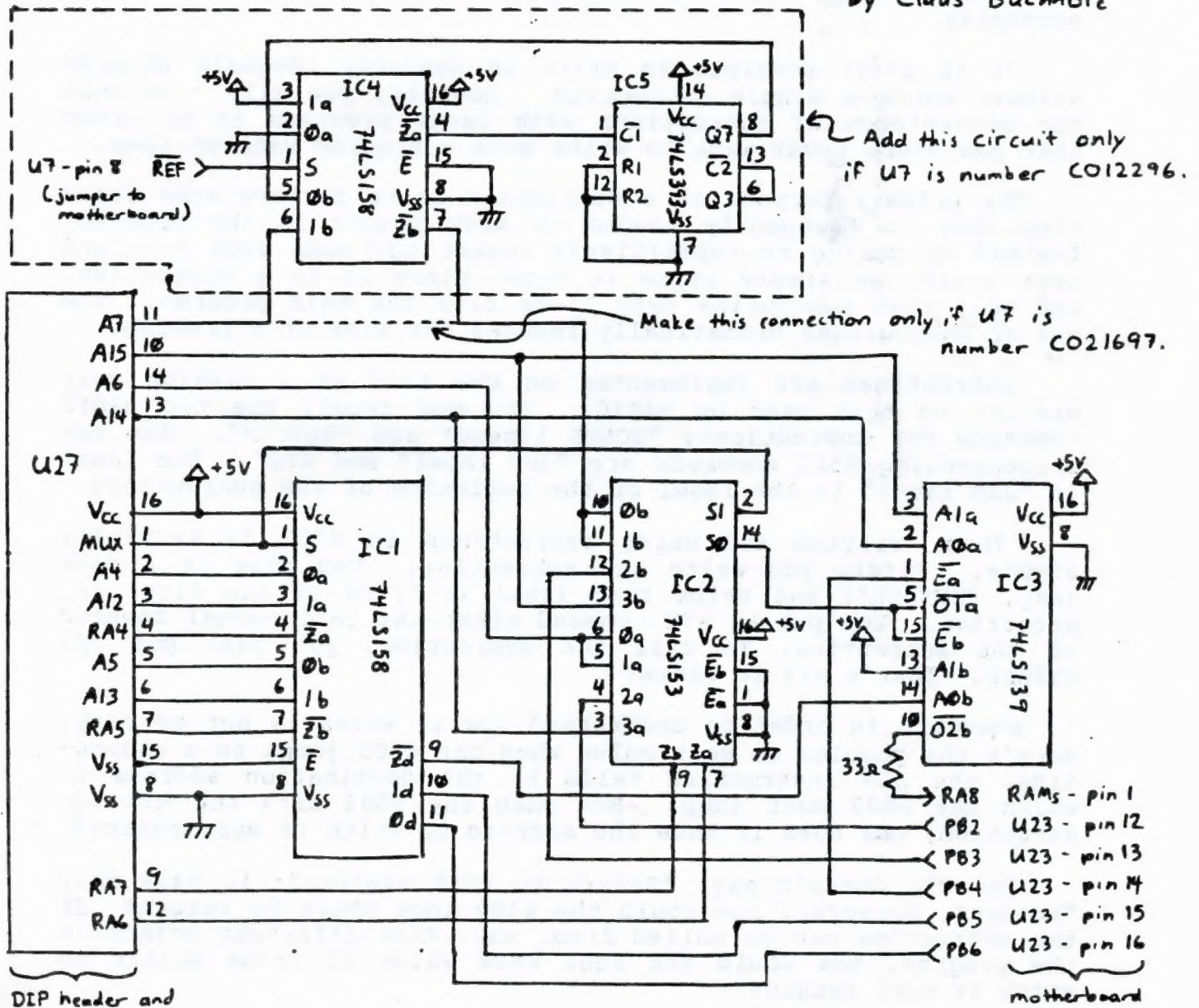
C=0 enables extended RAM for CPU

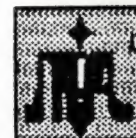
xy is 2-bit extended RAM bank #

- ranges from 0 to 3

A 130XE-compatible 256K Upgrade for the Atari 800XL

by Claus Buchholz





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CHRIS CRAWFORD ASSEMBLY LANGUAGE COURSE

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LESSON SIX: SUBROUTINES & THE STACK

We now take up the first topic in this series that is not absolutely essential to writing programs: subroutines. The loops and indexed addressing discussed in the previous lecture are truly essential: it is hardly possible to write a useful program that has no loops. Subroutines are a matter of convenience, not necessity

It is quite possible to write an entirely adequate program without using a single subroutine. However, you will find that the convenience of subroutines with large programs is so great that you would never want to write such a program without them.

The primary purpose of a subroutine is to perform some function that is frequently needed at many points in the program. Instead of having to repetitively insert the same code over and over again, we simply write it once, place it in a subroutine, and call that subroutine many times from the main program. The use of subroutines dramatically reduces the size of a program.

Subroutines are implemented on the 6502 in a fashion very similar to that used by BASIC. You may recall the two BASIC commands for subroutines: "GOSUB lineno" and "RETURN". The two corresponding 6502 commands are "JSR label" and "RTS". The label in "JSR label" is the label of the beginning of the subroutines.

Thus, writing and using subroutines in 6502 is trivially simple. First, you write the subroutine. You give it a name (say, "MYSUBR") and stick that label in front of the first instruction. You put an RTS command after the last normal command of the subroutine. To call the subroutine, you just put JSR MYSUBR. That's all it takes!

However, in order to understand how it works is not so easy. Here's the problem we must solve when the 6502 jumps to a subroutine, the JSR instruction tells it the destination address to which the 6502 must jump. But when the 6502 hits the RTS instruction, how does it know the address to which it must return?

The RTS doesn't say, "Return to THIS address"; it says only "Return". Moreover, how could the 6502 know where to return? If the subroutine can be called from, say, five different points in the program, how would the 6502 know which of those points to which it must return?



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What if we gave the 6502 a special register for remembering return addresses? That is, whenever the 6502 encounters a JSR instruction, it stores the current address into its return address register. Then when it encounters an RTS instruction, it simply takes the address out of the return address register.

There is only one problem with this: what if we use nested subroutines (one subroutine calls another)? The second subroutine call will erase the return address for the first subroutine call. Trouble!

The solution to all this is called a stack. A stack is a chunk of RAM allocated for certain special operations such as subroutines. The 6502 stack is stored on page one -- that is, addresses \$0100 to \$01FF. The stack operates like 128 return address registers arranged in sequence (remember: two bytes per address). The 6502 keeps a stack pointer register to keep track of which byte in the stack is currently being used.

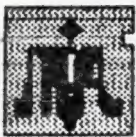
I will now trace through the operation of the stack in a subroutine. We start with the stack pointer set equal to \$FF. That means that the stack is empty; the stack pointer is at the very top of the stack. The 6502 encounters a JSR instruction. It takes the current value of the program counter and breaks it into two bytes. It pushes the first byte onto the stack. This means that it stores the first byte at \$01FF, then decrements the stack pointer. Now the stack pointer is \$FE.

Then the 6502 then pushes the second byte of the return address onto the stack, storing that byte at \$01FE and decrementing the stack pointer to \$FD. Then the 6502 jumps to the subroutine. When it encounters the RTS instruction, it pulls the two address bytes off of the stack (increments stack pointers and loads byte at address \$0100,SP). Those two bytes go directly into the program counter, returning the 6502 to the original entry point.

The advantage of this approach is that it allows very deep nesting of subroutines. If one subroutine calls another, the 6502 simply stores more values onto the stack. The addresses won't be confused because you always exit subroutines in exactly the reverse of the order that you entered them.

You can use the stack yourself, if you wish. You have six instructions that allow you to play with the stack: PHA, PLA, PHP, PLP, TSX, and TXS.

The PHA instruction pushes the value of the accumulator onto the stack and decrements the stack pointer. The PLA instruction increments the stack pointer and pulls the current stack value into the accumulator. These two instructions allow you to store and retrieve values onto the stack. They must be exactly balanced, though, or you will generate that most feared of bugs, the stack crashes.



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CHRIS CRAWFORD ASSEMBLY LANGUAGE COURSE

Consider: you are in a subroutine. You push a value onto the stack, but forget to pull it off. When the 6502 attempts to return to its original location, it pulls two address bytes off the stack -- but they're the wrong two bytes. One of them is the value you pushed but didn't pull. Result: the 6502 return to the wrong address. Your program goes haywire and the computer crashes.

This is called a stack crash. This type of crash tends to be particularly difficult to recover from. Prevention is the best medicine here. The rule for preventing stack crashes is simple and absolute: each and every push onto the stack must be balanced by one pull from the stack. Violate this rule and you will certainly experience a stack crash.

The next pair of stack manipulation instructions are PHP and PLP. These push and pull the process status register pmtpr the stack. They are useful for two purposes. First, you may wish to save the values of the various flags before performing some operation, then restore them so that you can branch on a previously created condition. Second, it is sometimes handy to PHP, then PLA to get the processor status register into the accumulator where you can more directly manipulate it. Again, each push must be balanced by one pull.

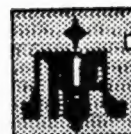
The third stack manipulation pair of commands do not modify the stack. They are TSX and TXS. These transfer the stack pointer to and from the x-register. Once in the x-register, you can change the value of the stack value and then TXS to jump over sections of the stack. This can be a very handy way to pass parameters to subroutines, but it is also very tricky. If you make a mistake, you will generate a stack crash. So be careful with this one. I have always avoided these commands like the plague. They are very dangerous and never essential.

ST WRITER QUICK REFERENCE

^A - Beginning of line	^B - Bottom Margin	^C - Center following line	^C ^C - Block text right
^D - Paragraph spacing	^E - Page eject	^F - Footer	^G - Printer font
^H - Header	^I - Paragraph indentation	^J - Right margin justify	^L - Left margin
^M - 2nd column left margin	^N - 2nd column right margin	^O - Send value to printer	^P - Paragraph Mark
^R - Right margin setting	^S - Line spacing	^T - Top margin	^U - Section heading
^W - Page wait	^V - Chain print files	^Y - Paper length	^Z - End of line
UNDO - Restores deleted block	INSERT - Duplicates marked block	Shift INSERT - Move block	Shift rt arrow - end of line
Shift left arrow - begin of line	Shift up arrow - up one page	Shift down arrow - down one page	RETURN - End paragraph
DELETE - Deletes character	Shift DELETE - Del to end of line	^ DELETE - Delete to end of file	ESC - Exit
CLR HOME - Deletes entire file	^ TAB - Clears all tabs	Shift TAB - restores default tabs	

/ F1 /	/ F2 /	/ F3 /	/ F4 /	/ F5 /	/ F6 /	/ F7 /	/ F8 /	/ F9 /	/ F10 /
/ End of /	/ End of /	/ Caps /	/ Set /	/ Delete /	/ Forward /	/ Query /	/ Merge /	/ Forms /	/ Subscript /
/ File /	/ Line /	/ Toggle /	/ Tab /	/ Block /	/ Search /	/ Replace /	/ File /	/ Fill in /	/ /

/ Shift F1 /	/ Shift F2 /	/ Shift F3 /	/ Shift F4 /	/ Shift F5 /	/ Shift F6 /	/ Shift F7 /	/ Shift F8 /	/ Shift F9 /	/ Shift F10 /
/ Start of /	/ Start of /	/ Underline /	/ Clear /	/ Set Block /	/ Reverse /	/ Global /	/ Save /	/ Expanded /	/ Super /
/ File /	/ Block /	/ Toggle /	/ Tab /	/ Marks /	/ Search /	/ Replace /	/ Line /	/ Print /	/ Script /



ADVENTURERS' ANSWERS

SEASTALKER the solution

As you sit quietly at the workbench in your research laboratory, you're startled into action by the sound of the videophone alarm bell. You'd better act quickly, because your buddy Tip Randall is raising the roof. The first thing to do is turn on the videophone. As soon as you do that, though, you realize that the picture is fuzzy. That's easy to correct; simply adjust the videophone. There is Commander Zoe Bly, looking worried, and telling you about an urgent problem at the undersea Aquadome. You'd better pick up the microphone, then turn it on. After asking Bly about the problem, question her about the monster she's seen. Bly is sounding ever more desperate, so tell her goodbye. Suddenly, however, something's wrong with the videophone, and your score drops by 3 points! Now is the time to go to the Computestor for a clue. First, turn off the microphone and drop the microphone onto the workbench. Then, head for the Computestor and turn it on. Since the machine is now ready for questions, ask it about the videophone. Hmmm...the problem could be one of many, but you suspect that something may be wrong with the electrical panel. The panel is just down the hallway, so go to the panel, and examine it. Well, well, apparently the circuit breaker is open. By fixing the circuit breaker, you regain your 3 points. However, you are starting to wonder whether treachery is afoot here in the lab. It's time to have a chat with your assistant, Sharon Keep. Go to the office and confront Sharon with your suspicions. Her answers are evasive, and she seems very nervous. Since time is growing short, you decide to leave Sharon and head for your sub, the "Scimitar." Realizing that the sub won't start unless you have the atomic catalyst capsule, you first examine the work counter. There is the capsule, so you grab it and head for the Scimitar. Once settled in the pilot's seat, with Tip nearby, you decide to check the sub for any problems. Pushing the test button gives you a positive readout, but you're still apprehensive. You will need to open the access panel in order to enter the sub's crawl space, but you don't have a tool. Maybe Tip has such an item? Tip comes through, handing you a Universal Tool. Open the access panel, and carefully crawl into the space. A check of the voltage regulator reveals that it is damaged. Use the tool to fix the regulator. Now all is A-OK, and you won't have any problems going full throttle to the Aquadome. You're ready to get underway, so crawl out of the space, close the access panel, close the sub's hatch, and put the catalyst capsule into the reactor. After closing the reactor, you'll need to turn on the reactor and fill the docking tank with seawater. Once the tank is filled, turn on the engine, open the tank gate, then open the throttle. Push the joystick to

the east, and you're off! The surface of Fropton Bay isn't the safest spot around, so the first thing you need to do is set your depth to 5 meters and set the throttle to slow. You'll want to check the sonar occasionally to make sure you're not heading toward any obstacles. Your sequence of moves must be accurate to avoid destruction. One quick way to reach the seawall opening is to follow these moves: Northeast, then three Norths, then Northeast again, then wait. The alarm bells may be ringing, but you'll safely avoid a submerged obstacle. Then, suddenly, an approaching ship is detected by the sonar. You'll have to stop waiting and set your depth to 15 meters to dive below the ship. Wait again, and you'll chug right on through the seawall opening into the ocean. Be sure to save the game here, since you won't want to cross Fropton Bay again! You can turn on the autopilot now, since the sub will head straight for the Aquadome. Because you fixed the voltage regulator, you can set the throttle to fast without overheating. Wait now, as you continue diving deeper and deeper. To check out an enormous whale, aim your searchlight to starboard. The trip will take a little while longer, so you might want to ask Tip about that magazine he's reading. A close study of a particular article in the magazine reveals that Dr. Jerome Thorpe (an Aquadome staff member) has succeeded in creating mutant sea creatures. Further, Thorpe announces in the article that he plans to marry your lab assistant, Sharon Keep! You're beginning to understand who's behind the attack on the Aquadome, and you're even more anxious to arrive. Wait a while longer, and then, as you near the structure, your sonarphone rings. It's Commander Bly, asking to speak privately with you when you arrive. You wait a few more turns, and the sub slows to a stop in the docking tank. Open the throttle to slide into the cradle. You wait while the water in the tank empties, and you save the game again. Before opening the hatch and exiting the sub, you pick up the emergency oxygen gear...just in case. Leave the Scimitar and head straight for the Aquadome's Reception Area where Bly and her crew await you. Greet them, and then take a quick look around. Your explorations are interrupted by a sudden realization that something is wrong with the air supply. Quickly using the oxygen gear you so intelligently brought with you, head for the Dome Center. Commander Bly and several crew members are gasping for breath, so time is short. Use the universal tool to open the access door to the air supply assembly. Instantly noticing that something has been unscrewed from an important cylinder, you pick up the object. It is an electrolyte relay. Put the relay into the cylinder, and close the access door. Your efforts are successful, and the air supply is now functioning properly. As you return to the Reception Area, you observe Doc Horvak with Bly's oxygen gear. You're suspicious, so when Bly ask you to accompany her to the office, you go with her. She volunteers some interesting information: She suspects sabotage in the Aquadome and shows you certain evidence. The evidence consists of a black box which you open and

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examine. This device could be used to interfere with the Aquadome's sonar, and Tip has an idea about how to trap the saboteur. Go to the Storage Room with Tip and discuss his idea. Before you reach the storage area, you notice the special Fram Bolt Wrench lying under Bly's desk. Realizing that the wrench must have been used to tamper with the air supply, you show it to Doc Horvak. His reaction proves most interesting. Now you need to do some serious thinking. Conversations with various crew members will assist you in your search for the traitor. Ask everyone about everyone else, check the locker in the men's dorm, set the black box onto the sonar, and observe everyone's behavior. Commander Bly will offer to supply you with a bazooka so that you can hunt the monster (the "Snark"). Get that from her and have Tip install it on the sub's extensor claw. Find Doc Horvak and show him the magazine article about Thorpe. Doc will come up with some interesting conclusions, and will offer to prepare a special tranquilizer gun for you. Get the dart gun and have Tip install that as well. During your explorations and conversations, Mick Antrim will check out the Scimitar then return and ask you whether you'd like to have an Emergency Survival Unit installed in the sub. You agree, then poke around a while longer until the unit is in place. It's time to think about improving your navigation and sonar -- the Snark will be difficult to capture or kill. You ask Tip about installing a fine grid and a fine throttle control in the sub, and he agrees to do so. You're about ready to head out into the ocean again, but you still haven't come to a firm conclusion about who the Aquadome traitor is. Once in your pilot's seat, however, you notice that the survival unit installed by Amy and Bill is equipped with a nasty looking syringe. Grabbing the syringe, you head for Doc Horvak and ask him to analyze it. His analysis reveals that the hypo is filled with arsenic! You'd better confront Amy and Bill with this evidence before you do anything else. The instant you show the syringe to Bill, he turns and runs away. He's heading for the sub, and you race to the office to view his actions on the station monitor. As you watch Bill climb down the inside ladder of the docking tank, you realize you have only seconds to trap him. You quickly turn off the docking tank electricity so Bill can't open the gate. He knows he can't get out now, so he surrenders. You turn the electricity back on, and leave the office. Cheers follow you as you head back to the Scimitar. After filling the docking tank with water, you turn on the engine and open the gate. Turning the joystick to the South, you open the throttle. Save the game, and head out into the ocean. You're finally ready to confront the Snark and, perhaps, the evil Dr. Thorpe. Exit the Aquadome's docking tank by going South, then set the throttle to medium. Turn Southeast and wait until you reach the Snark and the Sea Cat (piloted by Dr. Thorpe). Thorpe will taunt you with his power, and admit his plan to wreck the Aquadome. Suddenly, Thorpe's transmission breaks off, and Sharon Kemp begins to speak to you. She explains how she only went along with

Thorpe to try to trap him, and she's ready to help you capture the Snark. Sharon has a lot of interesting things to tell you, but you don't have time to talk to her right now. The Snark is moving quickly toward the Aquadome, ready to batter it to bits. Here is one method you can use to put the Sea Cat out of commission before Thorpe has a chance to attack you: East twice, then check your sonar to make sure you're in position. Set throttle to slow, then turn South. Head Northwest four times. Oh oh! Dr. Thorpe has recovered consciousness and his voice is crackling over the sonarphone. Ignore him, and head Northwest twice more. The sub will be just to the East of the Sea Cat, so, all on one line, enter the following commands: West then aim bazooka at power pod then shoot power pod with bazooka. There! You've done it! The Sea Cat is out of commission and Thorpe's out cold again. Sharon guides the Snark to its hidden cavern so that you can safely study it later. You've completed your mission and saved the Aquadome!



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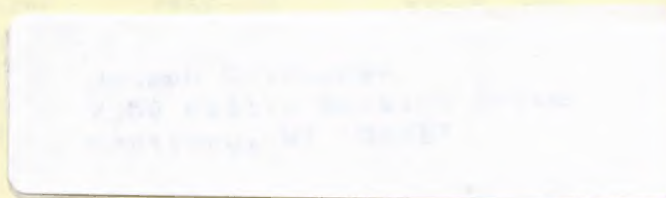
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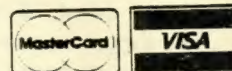
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